

**A Demonstration of
Submerged Aquatic Vegetation/Limerock Treatment
System Technology for Removing Phosphorus
From Everglades Agricultural Area Waters
*Fifth Monthly Report***

Prepared for:

South Florida Water Management District
3301 Gun Club Road
West Palm Beach, FL 33406

and

Florida Department of Environmental Protection
Twin Towers Office Building
2600 Blair Stone Road, MS 3560
Tallahassee, FL 32399-2400

Prepared by:

DB Environmental Laboratories, Inc.
414 Richard Rd.
Rockledge, FL 32955

December 28, 1998

Introduction

On February 12, 1998, the District contracted with DB Environmental Laboratories, Inc. (DBEL) to design, construct, operate, and evaluate a 13-month, tank-scale (i.e., "mesocosm") demonstration of SAV/ Limerock Treatment System technology for reducing P discharge from EAA waters. The objectives of this project are twofold. First, obtain the performance data and operational experience necessary to evaluate the technical, economic, and environmental feasibility of using SAV/Limerock technology for P removal at either the watershed basin- or farm-scale. Second, guide the design and operation of a larger, field-scale SAV/Limerock demonstration project should the District choose to investigate this technology further. This report summarizes progress during the ninth month (project weeks 40 - 44) by DB Environmental Laboratories, Inc. (DBEL) on the Submerged Aquatic Vegetation/Limerock (SAV/LR) demonstration project.

Synopsis of Progress to Date

North Project Site

All experiments at the North Supplemental Technology Site are proceeding according to the attached schedule (Fig. 1). Phosphorus concentrations in the agricultural drainage water recently have been highly variable at this location, presumably due to fluctuations in rainfall in the Everglades Agricultural Area and variable pumping rates of the ENR influent and S-5 pump stations. From the period mid-November through mid-December, influent total P concentrations (based on weekly composite samples) ranged from 84 to 185 ppb, and averaged 140 ppb. The SAV mesocosms have proven to be robust to these wide swings, sharply dampening their magnitude. For example, in a “sequential deep/shallow” SAV system that we established in October 1998, effluent from the first unit process (a 0.7 m deep SAV system with 3.5 day HRT) averaged 24 ppb (range of 15 - 30ppb), and that from the second unit process in series (a 0.3m deep SAV system with 1.5 day HRT) averaged 12 ppb (range of 10 - 13 ppb).

During this month we collected our second set of “extended” water quality parameters (i.e., nitrogen species, minerals, color, etc.), but results of these analyses are not yet available.

South Project Site

All mesocosms at the South Site are performing well. The shallow (10 cm), low velocity SAV/LR system has continued to provide effluent total P values at or below 10 ppb since early September. The total P concentrations in the ENR effluent (= influent to experimental raceways) continue to be quite low, however, typically below 20 ppb.

In the 10 cm deep raceways, we collected algae and macrophyte biomass samples at several locations from influent to effluent regions of the system. These samples are being analyzed for dry weight and total P content. Dry weight productivity measurements (and biomass harvesting) in the shallow, high velocity continue to be performed on a 10 - 14 day cycle.

Sediment, Vegetation and Water Quality Measurements in the ENR

Subtask 5A of this demonstration project entails field observations of different SAV communities in the ENR project. We performed a brief evaluation of SAV populations in ENR Cells 1 and 4 during late April 1998. This work was conducted to assess which SAV species should be stocked into our experimental mesocosms, and to obtain a preliminary assessment of water quality profiles in the SAV-populated regions of the ENR.

On December 19 and 20, we performed more rigorous sampling in these same ENR Cells. Cell 4 is dominated exclusively by SAV, primarily *Najas*, with some *Ceratophyllum*, *Potamogeton*, and *Chara*. Cell 1 contains dense cattail stands along the eastern edge, as well as in the influent and effluent regions of the cell. The middle of the Cell 1 is now open water populated with SAV beds containing the above species as well as *Hydrilla*.

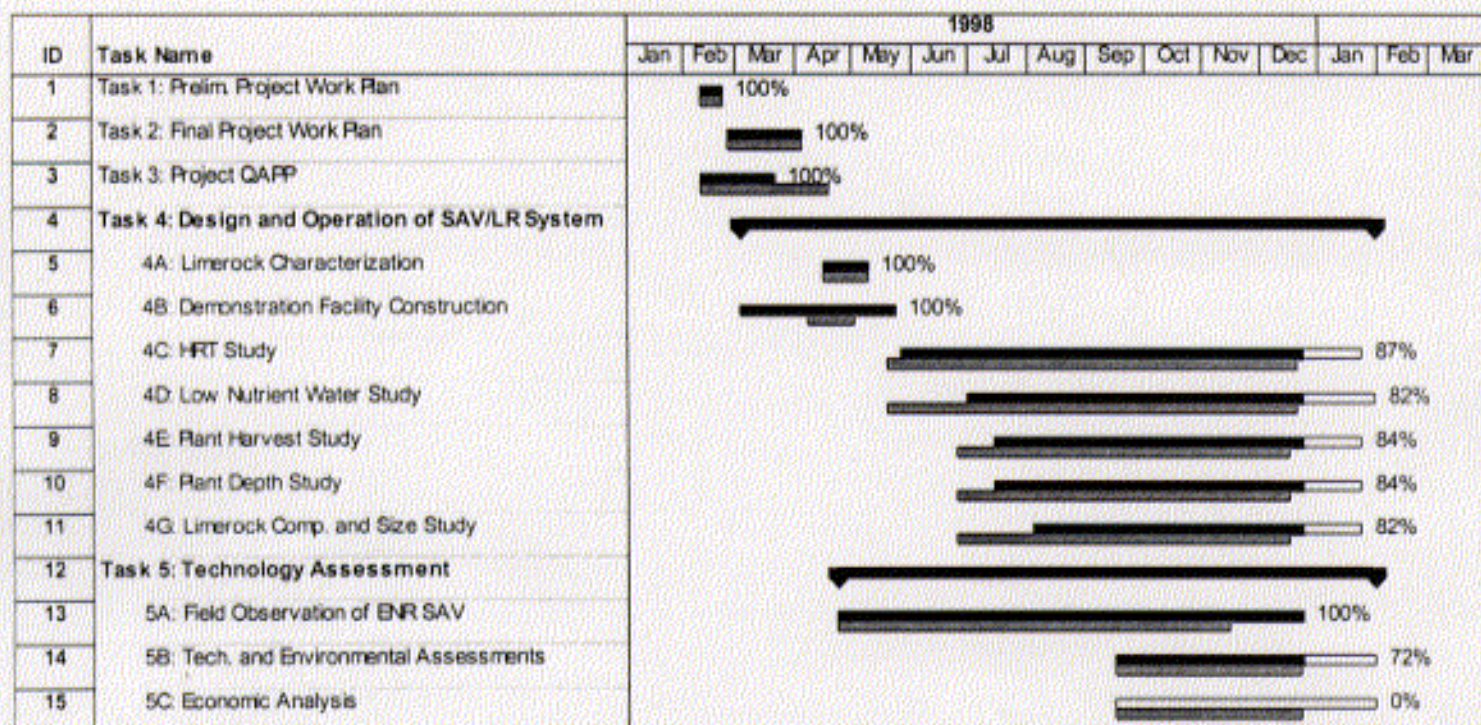
In Cell 4, we collected four sediment cores from the influent region, and three sediment cores from the effluent region. These cores were sectioned into three depth fractions, and

transported to the lab for bulk density, total P, carbon, nitrogen and calcium analyses. Samples of submerged vegetation were also collected from these sites, for analysis of dry weight standing crop and the above-listed elements. Water samples were collected in Cell 4 during the daytime at the influent, effluent, and along two transects (both perpendicular to flow) situated across the middle of the cell. These samples are being analyzed for total P, TSP and SRP.

In Cell 1, we established three transects, running from influent to effluent regions. The western and central transects each had five sampling stations, and the easternmost transect had three sampling locations. In order to define diel variations in water quality, we sampled the five westernmost transect stations during both night (0300 - 0600) and daytime (1100 - 1700). The remaining Cell 1 sample locations were sampled only during the daytime.

At each site, field measurements were performed (dissolved oxygen, temperature and pH) and water samples were collected from two depths (10 cm below surface and 10 cm above bottom). The water samples were field-filtered and transported to the lab for analyses of TSP and SRP.

Analyses from this sampling event are not yet complete, but one key finding is that soluble reactive P (SRP) levels for SAV bed surface waters do not increase at night (Fig. 2). Bottom waters, by contrast, exhibit slightly higher SRP concentrations, particularly at night. The consistent surface water SRP levels over a diel period in Cell 1 complements our previous mesocosm observations, where we observed little diel variability in P species in the system effluents. Therefore, the diel pH water column fluctuations that we observe in ENR SAV communities are not mirrored by changes in P concentrations.



Legend

Proposed Period

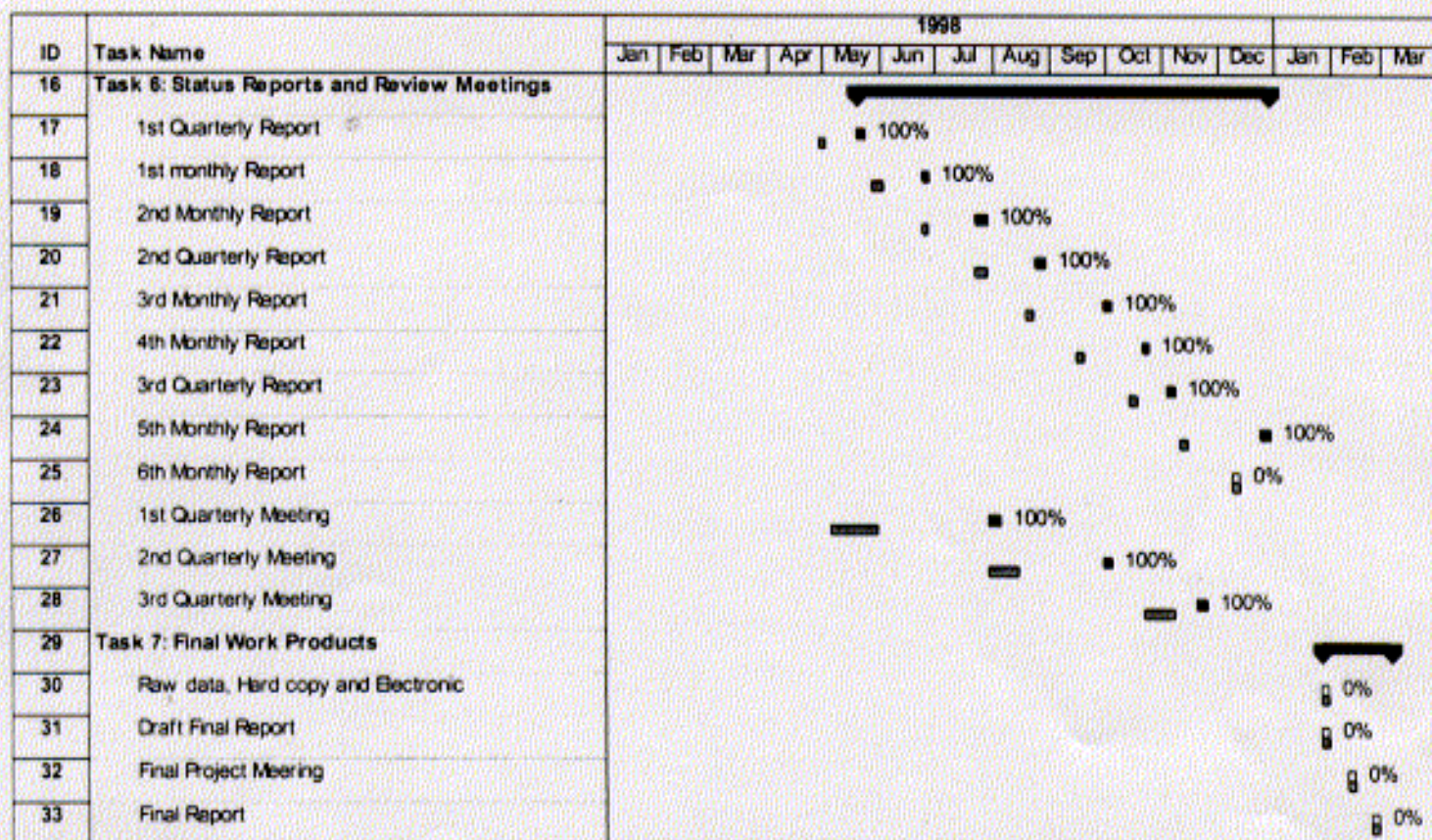
Adjusted Period

Task Progress

Task Summary



Figure 1. SAV/Limerock Project Schedule



Legend

Proposed Period

Adjusted Period

Task Progress

Task Summary

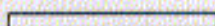


Figure 1 (cont.) SAV/Limerock Project Schedule

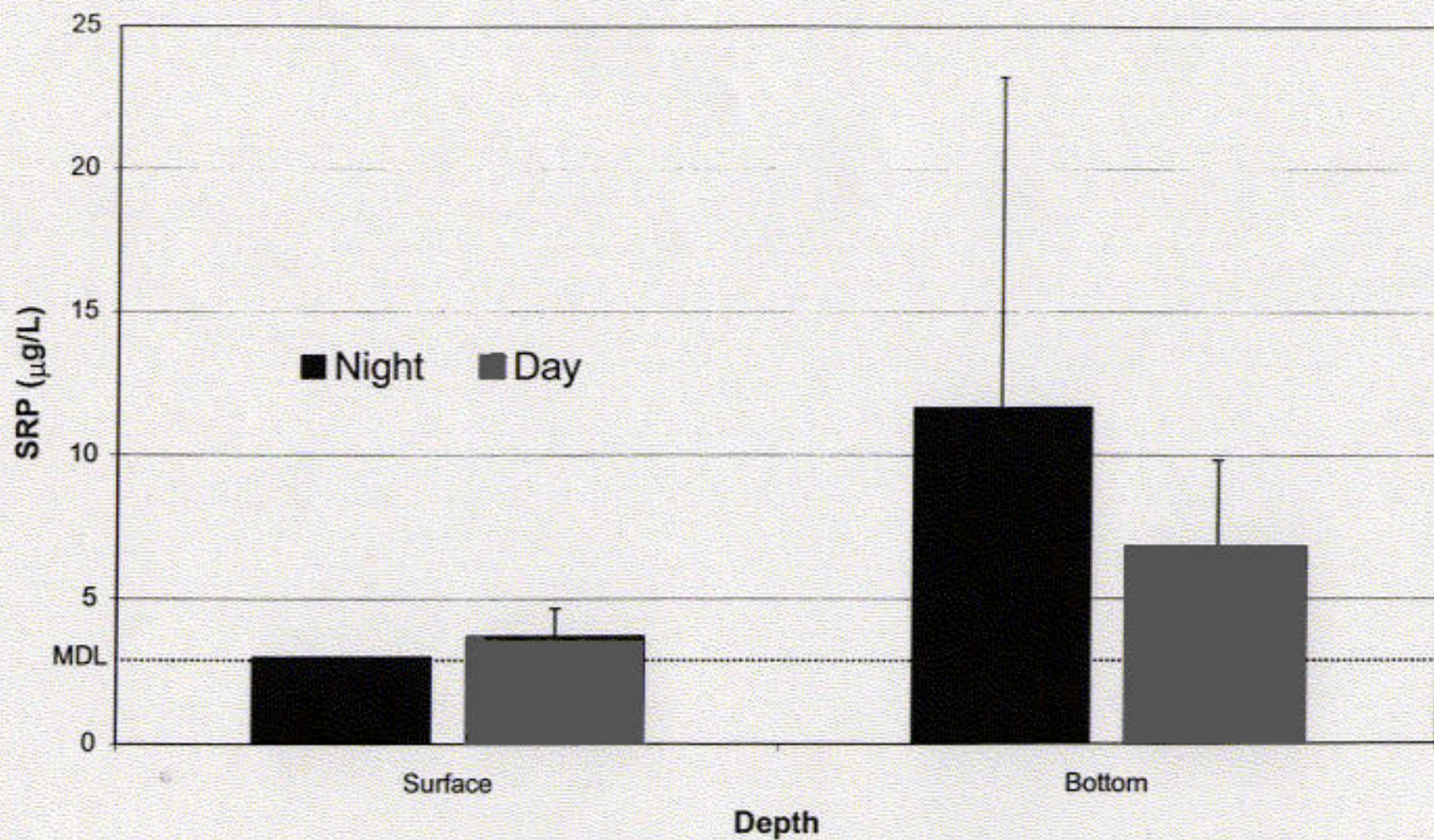


Figure 2. Night and daytime water column SRP concentrations for SAV communities in ENR Cell 1. Values represent means and standard deviations (n=3 to 7).